

### **REMARKS**

Claims 1-10 are pending in the above-identified application and stand ready for further action on the merits.

Claim 1 has been amended to recite a pH of 2 to 6 and a mass% of hydrofluoric acid of 0.1 to 5.0. Support for these recitations can be found in the present specification, *inter alia*, at page 5, line 32 as well as Table 1 on page 15, Table 3 on page 17, Table 5 on page 18, and Table 7 on page 19. The present amendments to the claims do not introduce new matter into the application as originally filed.

### **Issues under 35 U.S.C. § 102**

1) Claims 1-10 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Morinaga '744 (US 6,896,744). Applicants respectfully assert that Morinaga '744 does not disclose each and every element of independent claim 1. Therefore, Morinaga '744 does not anticipate or render obvious claim 1.

### **Legal Standard for Determining Anticipation**

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art." *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir.

2001) “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Legal Standard for Determining Prima Facie Obviousness

MPEP 2141 sets forth the guidelines in determining obviousness. First, the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. The four *Graham* factors are:

- (a) determining the scope and content of the prior art;
- (b) ascertaining the differences between the prior art and the claims in issue;
- (c) resolving the level of ordinary skill in the pertinent art; and
- (d) evaluating any evidence of secondary considerations.

*Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966).

Second, the Examiner has to provide some rationale for determining obviousness. MPEP 2143 sets forth some rationales that were established in the recent decision of *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Exemplary rationales that may support a conclusion of obviousness include:

- (a) combining prior art elements according to known methods to yield predictable results;

- (b) simple substitution of one known element for another to obtain predictable results;
- (c) use of known technique to improve similar devices (methods, or products) in the same way;
- (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- (e) “obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success
- (f) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
- (g) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

As the MPEP directs, all claim limitations must be considered in view of the cited prior art in order to establish a *prima facie* case of obviousness. *See* MPEP 2143.03.

*Distinctions over the Cited Art*

Although described by Morinaga ‘744, RCA cleaning is known as conventional technology. This RCA cleaning consists of SC-1 cleaning and SC-2 cleaning. SC-1 cleaning consists of a solution of ammonia, hydrogen peroxide, and deionized water. SC-1 cleaning is for removing particles. SC-2 cleaning consists of a solution of chloride, hydrogen peroxide, and deionized water. SC-2 cleaning is for removing metal impurities.

The substrate surface cleaning method of Morinaga ‘744 involves cleaning the substrate surface with an alkaline cleaning liquid in step (1) and then cleaning with a cleaning agent

having a hydrofluoric acid content of from 0.03 to 3 wt % in step (2). Thereby, Morinaga '744 suggests that heavy metal impurities and particles are removable.

The Examiner cites the alkaline cleaning liquid of step (1). This alkaline cleaning liquid contains ammonium hydroxide and complexing agents. The complexing agents include phosphoric acid and hydrofluoric acid as recited in section 4, "Others," of Morinaga '744. However, the function and effect of the complexing agents in Morinaga '744 are the removal of metal impurities and not particles. Moreover, the content of the complexing agents is 1-10,000 ppm, which is a very low concentration. Furthermore, the examples only disclose EDDHA, EDTA, NTPO, and RDDHA as complexing agents. In addition, the pH of this cleaning liquid is 9 or more, and in the examples, the pH is 10-10.5.

In stark contrast, the present invention, as amended, recites "a pH ranging from 2 to 6" in claim 1.

Morinaga '744 also discloses APM cleaning. Although APM cleaning is excellent in particle removal, it is inadequate in removal of metal impurities, as known by one of ordinary skill in the art. APM cleaning liquid contains the complexing agents of Morinaga '744.

Enclosed herewith is an unsigned 37 CFR § 1.132 Declaration of Shigeru Kamon, one of the present inventors. The Examiner is respectfully requested to review the enclosed Declaration of Shigeru Kamon as it provides strong evidence of the patentability of the present invention. A signed copy of the Declaration will be promptly filed with the USPTO once the same is received by the offices of the undersigned. Thus, the USPTO is requested to properly consider the enclosed Declaration at this time.

In the enclosed Declaration, Table 20 shows the pH value of APM cleaning liquids of the same compositions as disclosed in the examples of Morinaga '744. The pH of the solution when adding phosphoric acid and hydrofluoric acid was measured. When hydrofluoric acid is added, the sample shows acidity. For this reason, in order to make the pH of the sample be 9 or more, then hydrofluoric acid needs to be added at a very low concentration. Thus, the composition of Morinaga '744 cannot be effective at removing both metal impurities and particles.

In stark contrast, the present invention is greatly different from Morinaga '744 in that it has the function and effect of removing both metal impurities and particles by one liquid composition. In other words, the present invention has an alkali component and hydrofluoric acid in one liquid, which can remove both heavy metal impurities and particles. Furthermore, claim 1 requires that one aqueous solution contains both phosphoric acid and hydrofluoric acid.

Morinaga '744 discloses the combination of acid cleaning and alkali cleaning, from which pH differs. Morinaga '744 fails to disclose combining these ingredients into one liquid.

Accordingly, the present invention is not anticipated by Morinaga '744 since the reference does not teach or provide for each of the limitations recited in the pending claims. Specifically, Morinaga '744 fails to disclose the recited pH range of the present invention.

For completeness, Applicants also respectfully submit that Morinaga '744 does not render the present invention obvious because the reference provides no disclosure, reason, or rationale that would allow one of ordinary skill in the art to arrive at the present invention as claimed.

2) Claims 1-10 have been rejected under 35 U.S.C. § 102(b) as being anticipated or alternatively as being rendered obvious under 35 U.S.C. § 103(a) by Sakon '857 (US 5,560,857). Applicants respectfully assert that Sakon '857 does not disclose each and every element of independent claim 1. Therefore, Sakon '857 does not anticipate or render obvious claim 1.

The cleaning liquid of Sakon '857 is an acid solution containing 0.005% to less than 0.05% by weight hydrogen fluoride and 0.3% to 20% by weight hydrogen peroxide, having a pH in the range of 1 to less than 5.

As amended, independent claim 1 recites, *inter alia*, "0.1 to 5.0 mass% of hydrofluoric acid."

As discussed above, Sakon '857 discloses a hydrofluoric acid content outside the range of the present invention. Moreover, Sakon '857 teaches away from a hydrofluoric acid content higher than 0.05% by weight. Sakon '857 recites, "A content of hydrogen fluoride higher than 0.05% by weight may make the surfaces of the cleaned silicon wafers hydrophobic with the number of fine particles adhered being greatly increased after cleaning as can be seen from Comparative Examples 48 and 49 in Table 1" (col. 4, lines 41-45). Thus, Sakon '857 provides no suggestion for a content of hydrofluoric acid greater than 0.05% by weight.

Furthermore, Sakon '857 recites the following background technology:

The cleaning of those wafers, for example, silicon wafers, is performed by a so-called SC-1 cleaning process using primarily a mixture of an aqueous solution of hydrogen peroxide/ammonia water/pure water to remove organic materials and deposited fine particles.

However, such cleaning solution may inevitably cause contamination with Fe, Zn and Al which are trace metal contaminants in the solution. For this reason, all the wafers, from which metal contaminants must be removed, are cleaned by the SC-1 cleaning process, followed by cleaning with acidic solution.

Acidic solution for cleaning may advantageously remove metal contaminants on the surfaces of wafers, but disadvantageously cause adhesion of fine particles contained in the solution onto the wafers in the course of cleaning. Therefore, there has been sought in the semiconductor device and silicon wafer industry a technique capable of cleaning wafers having less contamination with fine particles, if any. Similar circumstances have been prevailing in the field of techniques for cleaning silicon oxides such as quartz glass wafers (col. 1, lines 13-33).

However, these adhesion particles originate in the washing liquid and do not remove the particles adhering to the silicone surface.

As mentioned above, by conventional technology, the cleaning liquid from which particles are removed is alkaline solution, and the washing liquid from which metal impurities are removed is acid solution.

For this reason, the present invention differs from the prior art in that the present invention enables both the removal of particles and reduction of metal impurities with one liquid. The cleaning liquid of Sakon '857 is merely an extension of the conventional technology.

Accordingly, the present invention is not anticipated by Sakon '857 since the reference does not teach or provide for each of the limitations recited in the pending claims. Specifically, Sakon '857 does not disclose the recited content of hydrofluoric acid.

In addition, a *prima facie* case of obviousness has not been established. To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be disclosed by the prior art. As discussed above, Sakon '857 fails to disclose all the claim limitations of independent claim 1, and those claims dependent thereon. Therefore, withdrawal of the outstanding rejection is respectfully requested.

For the reasons given above, the reference does not render the present invention obvious because the cited reference does not disclose at least one feature of the present invention and its effects. Furthermore, the cited reference or the knowledge in the art provides no reason or rationale that would allow one of ordinary skill in the art to arrive at the present invention as claimed. Any contentions of the USPTO to the contrary must be reconsidered at present.



**CONCLUSION**

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of pending claims 1-10 are allowed and patentable under the provisions of Title 35 of the United States Code.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Chad M. Rink (Reg. No. 58,258) at the telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By 

John W. Bailey

Registration No.: 32,881

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road

Suite 100 East

P.O. Box 747

Falls Church, Virginia 22040-0747

(703) 205-8000

Attorney for Applicants

Attachment: unsigned Declaration of Shigeru Kamon